

Between June 29 and August 24, maximum 71.2°, minimum 24.0°.

Between August 4 and September 4, maximum 70.8°, minimum -2°.

Between September 4 and October 7, maximum 65.5°, minimum -4.5°.

At the last reading a partial coating of ice was found on the bulbs of both thermometers and the actual reading of the minimum thermometer at that time after resetting was 23° and a stiff wind was blowing. Ice crystals an inch long fringed the shelter.

A rain gage is also established at the same place and the total accumulated precipitation during the three above mentioned intervals was 0, 0.41, and 0.08 inch, respectively. On October 7, snow lay on the ground in small patches from 2 to 15 inches deep.

Professor Church noted on September 4 that wild currants on the summit were ripe and daisies were still yellow in spite of the temperature of -2°.

The low temperature, -4° F., during the month of August at the summit seems at first in striking contrast to the hot weather experienced in the lowlands, but is fully explained by considering all the circumstances that go to determine the temperature of any layer of air in the atmosphere. Of course in lowlands minima mostly occur at nighttime and are mainly due to the influence of radiation of heat from the ground. Cooling by radiation takes place far more rapidly from the rocky surface of a mountain than from a particle of air distant therefrom. The cold air chilled by contact with and by radiation to the mountain surface flows to a lower level and continues cooling while a fresh supply takes its place; therefore temperatures fall much lower in shallow basins where the cold can intensify than they do on pinnacles of rock where no accumulation of quiet cold air and no intensification of cold can take place. Temperatures will fall to an unexpected degree if air or water is kept in a shallow basin which can lose by radiation but can gain none by convection. The mountain winds or valley winds that begin to be felt in the afternoon and continue strong during the whole night represent the downflow of cool air from the upper parts of the mountain whose forests or rocky soils are cooled by radiation. This descending cool air is warmed up by compression as it comes under greater atmospheric pressure and the rate of warming averages very nearly one degree Fahrenheit for each 186 feet of descent, but if it receives a little heat from other sources, or if it mixes with the warmer air of the lowlands this rate of warming may be one degree for 150 feet or even 100 feet; thus at Reno itself, whose station is 4484 feet above sea level and 6316 feet below the summit of Mount Rose, we should expect to find differences of at least 40° or 60° between the two places and if the location of the thermometer on the summit is such that it comes under the special influence of local radiation, then the differences may be greater to almost any extent. It is even possible that a special cold wind from the north such as occurs in our areas of high pressure and cold waves may bring temperatures to the summit of the mountain for a few hours during clear nights such as are out of all proportion lower than those of lower stations.

The lowest temperature recorded at the State University during the interval, August 4-September 1, was 46° and this would ordinarily correspond to something between 16° and 26° at the summit. The difference between this and the observed record of -2° is probably to be attributed in part to the great radiation taking place from the rocks of the summit and the imperfect ventilation within the thermometer shelter, but largely to the fact that there pass over mountain top masses of air that are very cold but do not of themselves settle down into the valley below. They come with the areas

of high pressure, spread out horizontally mostly southward and southeastward or even eastward with great velocity and descend to the earth on a very gentle gradient, so that by mixture and solar radiation they are warmed up before reaching the cold stratum covering a distant lowland region. Such low temperatures are common on all the mountain peaks although the lowest temperatures will happen in the lowlands if cold air accumulates at nighttime and the warmer air has to stay above it. Balloon work has shown that there may exist even three or four alternations of temperature along the vertical and that therefore the atmosphere is often in unstable equilibrium within a definite special range of elevation.

PROTECTION FROM FROST.

Mr. A. C. Bennett, a Wisconsin cranberry grower, writing under date of May 15, 1905, describes the methods used by him for the protection of his cranberry marshes against frost as follows:

At Cameron, Wis., I have a large marsh almost entirely surrounded by banks 25 to 35 feet high, with sloping sides. I have a fine trout stream for my water supply. My principal reservoir is northwest of the plantation, and I divert the creek from its old bed and carry it around outside of the marsh, forming a succession of reservoirs entirely surrounding the marsh on its border, from 5 to 30 rods wide.

The cold air as it slides down the high surrounding banks must cross the reservoirs of water and pass over the dams before it can reach the vines. The outlet of the marsh is through a ravine at the south, and gives air drainage to the Menominee River.

I think this would be an ideal place to test the plan of fencing off the upland cold air, also the plan of adding humidity to the air by using the water in the creek to run sprayers as it comes from the large reservoir northwest of the planted marsh.

PUBLICATION OF THERMOGRAMS IN FACSIMILE.

The San Diego Chamber of Commerce has shown its interest in the study of the climate of that region by issuing a monthly sheet embodying a photographic reduction of the complete thermograph record for the month and also the regular Monthly Meteorological Summary as furnished by Mr. Ford A. Carpenter, the Official in Charge of the Local Office of the Weather Bureau at San Diego.

This offers striking evidence of the temperature conditions at San Diego and will be very convenient for the use of those who desire to compare local temperatures with hygienic and crop conditions.

STRUCTURE OF HAILSTONES.

A curious fact was noted some years ago by a close observer, namely, that hailstones when melting away in a pail of water end their career by giving up a large bubble of air which had evidently been enclosed under great pressure in the white snow that forms the center of the hailstones. We hope that many of our observers, regular or cooperative, may have the opportunity to repeat this observation and will send us the results, whether positive or negative. Observe as closely as possible the size of the cavity that appears to contain the air and also the size of the bubble of air as it ascends through the water. In fact the latter measurement may be made quite easily by using soap suds instead of pure water and measuring the size or volume of the soap bubble. Many hailstones should be measured so that we may figure on the variations that must occur between them.

THE PAGOSCOPE VERSUS THE DAILY WEATHER MAP.

Pagoscope is the name of a new device for popular use in France tending to lighten the labor of deciding whether there is danger of a severe frost during the approaching nighttime. The instrument attempts to show at a glance whether the prevailing dew-point is below freezing, or 32° F., and leaves it to the observer to infer that if below freezing then a frost is pos-

sible. But the fact is that frosts depend on the movement of the great areas of clear dry air and on this point an observer must consult the daily weather map, since a local instrument no matter what its name or style can tell us little or nothing. We know that in a general way these areas move to the south and east over the United States and sometimes spread westward, while the center is moving southward, but this knowledge is derived from the weather maps and all special cases must be studied with their help.

The pagoscope, so-called, is essentially the same as the well known "hygrodeik," having wet and dry bulb thermometers with an engraved dial card between them and a sliding pointer attached to a vertical frame. By setting the indexes at the readings of the dry bulb and wet bulb, respectively, we mechanically cause the pointer to move over the surface of the dial card and when it comes to rest it points out the vapor pressure, relative humidity and dew-point prevailing at that moment. The pagoscope seems to differ from the hygrodeik only in that the area on the diagram corresponding to temperatures near freezing is colored yellow; if the dew-point is decidedly below freezing, so that frost is highly probable, the area is colored red; if the dew-point is decidedly above freezing, the corresponding area is colored green, in which case frost is not likely unless a wave of colder, drier air advances from a distance to the station. But this latter is exactly what is so likely to happen, and in order to anticipate this danger we must study the daily weather map.

WEATHER BUREAU MEN AS EDUCATORS.

Mr. F. H. Brandenburg, District Forecaster, Denver, Colo., reports under date of September 30, 1905, that while at Mancos, Colo., pursuant to the request of the principal of the school, he gave an informal talk to the pupils of the high school regarding the work done by the Weather Bureau.

Mr. George W. Chappel, Local Forecaster, Des Moines, Iowa, reports that on October 18, 1905, he gave a talk to the students in the Soils Department of the State Agricultural College at Ames. The morning map of the 14th was reproduced and the methods of taking observations, transmitting reports, making maps, and disseminating information were explained. A full explanation was given of the course usually taken by the high and low areas, the circulation of winds, areas of precipitation, etc.

Dr. I. M. Cline, District Forecaster, New Orleans, La., reports under date of November 6, 1905, that on October 10 he delivered a lecture to the combined Epworth League societies of New Orleans on the weather map and forecasting the weather. About 400 persons were present.

Mr. L. M. Dey, jr., Assistant Observer, Lewiston, Idaho, reports that the physical geography class of the State Normal School visited the office on October 20, 1905, for the purpose of receiving instruction in the drawing of isobars and isotherms on the daily weather map.

Mr. R. J. Hyatt, Local Forecaster, Salt Lake City, Utah, reports that the training class of the Latter Day Saints University visited the office on October 9 and 10, and were instructed in meteorology and were shown the workings of the office.

The principal of the Training School of the University of Utah also visited the office and was shown the instruments, weather maps, and the manner of taking the observations. The pupils of the Training School will visit the office later for instruction.

Mr. D. S. Landis, Assistant Observer, Fort Worth, Tex., re-

ports under date of August 22, that he has a class of four young men who are studying meteorology systematically, using Waldo's text-book, two hours a week.

Mr. U. G. Pursell, Local Forecaster, Erie, Pa., reports under date of October 31, 1905, that the class in physical geography of the Erie High School visited the office on October 24 and 25 for instruction in the use of meteorological instruments and in the preparation of the daily weather map.

Mr. Clarence J. Root, Assistant Observer, Charles City, Iowa, reports under date of August 11, 1905, that he gave a stereopticon lecture on the U. S. Weather Bureau and its work to an audience of over 3000 at the Charles City Chautauqua.

Mr. M. R. Sanford, Observer, Syracuse, N. Y., reports that he gave a course of twelve lectures on meteorology and climatology in the Syracuse University during the second semester of the college year, 1904-5. The course consisted of one lecture each week and class exercises in map making. Weather Bureau forms, charts, and instruments were used in illustrating the methods in practical use.

Mr. A. H. Thiessen, Section Director, Raleigh, N. C., under date of September 8, 1905, submits the following outline of a course of lectures which will be given to a class of agricultural students at the Agricultural and Mechanical College of North Carolina at Raleigh.

METEOROLOGY AND CLIMATOLOGY.

1. Meteorology and climatology defined. The atmosphere, its position, composition, functions, physical properties.
2. Nature of heat, temperature, radiation, absorption, reflection, conduction, temperature gradients, thermometry.
3. Atmospheric pressure, decrease with altitude, barometric gradient, convection, general circulation of the atmosphere.
4. Local winds and storms. Thunderstorms, tornadoes, water spouts, land and sea breezes, foehn, mountain and valley breezes, winds from snow fields, eclipse breezes.
5. Moisture in atmosphere, condensation, evaporation, dew, cloud, snow, hail, fog, frost, causes of precipitation.
6. Miscellaneous phenomena. Clouds and their classification, thunder, lightning, aurora, rainbows, corona, halo, color of the sky, of the sun, mirage.
7. Cyclones and anticyclones. Law of storms, cyclones, tropical cyclones, origin of cyclones.
8. History of thermometry. Thermometers, gas, liquid, metal, thermographs. History of barometry. Barometers, wind instruments, sunshine recorders, actinometers, rain and snow recorders.
9. Weather. Elements to be observed, how observed, measured and recorded, how charted and studied, weather forecasts.
10. Climatology. Factors of climate; temperature, moisture, rain, snow, sunshine, wind, solar climate, influences which change solar climate, continents, seas, forests, mountains. Periodic variations in climate. Climate of earth during geologic periods.
11. Practical application of meteorology and climatology to manufactures, commerce, and agriculture.
12. The weather organizations of the world, with particular reference to the U. S. Weather Bureau.

The class will visit the Weather Bureau Office at Raleigh during the term, witness map-making, the process of formulating forecasts, and will examine instruments and records.

Mr. George T. Todd, Local Forecaster, Albany, N. Y., reports that during September a class from the Albany High School, and on October 27, a class from the State Normal